AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method of determining production rates in a well, comprising:

determining a model of temperature as a function of zonal flow rates in the well;

measuring temperatures at a plurality of locations in the well; and

inverting, by a computer, the measured temperatures by applying the model to determine an allocation of production rates from different producing zones in the well, wherein the inverting comprises using an optimization algorithm that solves an optimization problem for calculating the production rates, where the optimization problem minimizes an error between the measured temperatures and corresponding temperatures calculated by the model.

2. (Currently Amended) The method as recited in claim 1, wherein determining the model comprises determining the model for a single-phase liquid producing well.

3. (Currently Amended) The method as recited in claim 1, wherein determining the model comprises determining the model for a multi-layer producing well.

4. (Currently Amended) The method recited in claim 1, wherein determining the model comprises determining the model for a multi-layer, single-phase liquid producing well.

5. (Currently Amended) The method as recited in claim 1, wherein determining the model comprises determining the model for a multi-layer, multi-phase liquid producing well.

6. (Currently Amended) The method as recited in claim 1, wherein measuring the temperatures comprises measuring temperature with a distributed temperature sensor.

7. (Currently Amended) The method as recited in claim 1, wherein the inverting comprises determining a degree of certainty in the production rates allocated.

8. (Currently Amended) The method as recited in claim 7, wherein determining the degree of certainty comprises determining a degree of error in the model, the method further comprising compensating for the determined degree of error in the model in performing the inverting.

9. (Currently Amended) The method as recited in claim 7, wherein determining the degree of certainty comprises determining a degree of error in the measured temperatures, the method further comprising compensating for the determined degree of error in the measured temperatures in performing the inverting.

10. (Currently Amended) The method as recited in claim 7, wherein determining the degree of certainty comprises determining a degree of error in well parameter values, the method further comprising compensating for the determined degree of error in the well parameter values in performing the inverting.

11. (Currently Amended) The method as recited in claim 1, wherein ~~inverting~~ using the optimization algorithm comprises utilizing a generalized reduced gradient optimization algorithm.

12. (Currently Amended) A method of determining flow rates in a well, comprising:

measuring ~~temperature~~ temperatures at a plurality of points along the well having a plurality of well zones and a plurality of liquid phases;[[and]]

measuring a total flow rate from the well; and

determining, by a computer, flow rates of the plurality of liquid phases through ~~each of~~ the plurality of well zones via the measured temperatures, wherein the determining comprises inverting the measured temperatures by applying a model, wherein the inverting comprises allocating by the total flow rate among the plurality of well zones.

13. (Currently Amended) The method as recited in claim 12, wherein measuring the temperature at the plurality of points comprises utilizing a distributed temperature sensor.

14. (Currently Amended) The method as recited in claim 12, wherein determining the flow rates comprises constructing [[a]]the model of temperature as a function of zonal flow rates in the well, and using the model to invert the measured temperatures in allocating the flow rates from the plurality of well zones based on the measured total flow rate.

15. (Currently Amended) The method as recited in claim 12, wherein determining the flow rates comprises determining flow rates of oil and water phases during production.

16. (Currently Amended) The method as recited in claim 12, wherein determining the flow rates comprises determining flow rates of fluid injected into each of the plurality of well zones.

17. (Currently Amended) The method as recited in claim 14, wherein inverting the measured temperatures comprises utilizing an optimization algorithm that solves an optimization problem for calculating the flow rates, where the optimization problem minimizes an error between the measured temperatures and corresponding temperatures calculated by the model.

18. (Cancelled)

19. (Currently Amended) A system, comprising:

a temperature sensor deployable with a production completion along a wellbore to sense temperature data at a plurality of wellbore locations during production; and

a processor system [[able]]configured to receive the sensed temperature data and allocate [[a]]flow [[rate]]rates from a plurality of wellbore zones based on the sensed temperature data, wherein the processor system is configured to allocate the flow rates by inverting the sensed temperature data using a temperature forward model, wherein the inverting comprises using an optimization algorithm that solves an optimization problem for calculating the flow rates, where the optimization problem minimizes an error between the sensed temperature data and corresponding calculated temperature data from the model.

20. (Currently Amended) The system as recited in claim 19, wherein the ~~processor system uses a~~ temperature forward model specifies~~, in which~~ temperature [[is]]as a function of zonal flow rates~~, to invert the temperature data and allocate flow rates from producing layers of a formation~~.

21. (Original) The system as recited in claim 19, wherein the temperature sensor comprises a distributed temperature sensor.

22. (Currently Amended) The system as recited in claim 19, wherein the processor system is ~~able~~configured to allocate flow rates in a multi-layer, multi-phase liquid producing well.

23. (Original) The system as recited in claim 19, wherein the production completion comprises an electric submersible pumping system.

24. (Original) The system as recited in claim 19, wherein the production completion comprises a gas lift system.

25. (Original) The system as recited in claim 19, wherein the wellbore is oriented generally vertically.

26. (Currently Amended) A method, comprising:

deploying a distributed temperature sensor along a wellbore;

utilizing a model of temperature as a function of fluid flow rates ~~into~~in the wellbore;

obtaining ~~temperature data~~ measured temperatures from the distributed temperature ~~system~~sensor;

~~allocating a~~determining fluid flow ~~rate~~ rates in corresponding ~~in at least one~~ wellbore ~~zone~~zones using the ~~temperature data~~measured temperatures in conjunction with the model, wherein the determined fluid flow rates are calculated using an optimization algorithm that solves an optimization problem, where the optimization problem minimizes an error between the measured temperatures and corresponding temperatures calculated by the model~~; and~~

~~determining error in the fluid flow rate~~.

27. (Currently Amended) The method as recited in claim 26, wherein ~~allocating~~ determining the fluid flow rates comprises inverting the ~~temperature data~~measured temperatures using the model to obtain the fluid flow ~~rate~~rates.

28. (Currently Amended) The method as recited in claim 26, wherein deploying the distributed temperature sensor comprises deploying the distributed temperature ~~system~~sensor in a generally vertical wellbore.

29. (Currently Amended) The method as recited in claim 26, wherein deploying the distributed temperature sensor comprises deploying the distributed temperature ~~system~~sensor in a deviated wellbore.

30. (Cancelled)

31. (Currently Amended) The method as recited in claim 26, wherein ~~allocating~~determining the fluid flow rates comprises determining flow rates for a single-phase liquid producing well.

32. (Currently Amended) The method as recited in claim 26, wherein ~~allocating~~determining the fluid flow rates comprises determining flow rates for a multi-phase liquid producing well.

33. (Currently Amended) The method as recited in claim 26, ~~wherein determining comprises compensating for~~ further comprising:

determining a model error, a measurement error, and a well parameter error; and

compensating for the model error, measurement error, and well parameter error when inverting using the model to determine the fluid flow rates.

34.-36. (Cancelled)

37. (New) The method as recited in claim 1, further comprising:

measuring a total flow rate of the well at a wellhead; and

allocating, by the model, the total flow rate among the different producing zones based on the measured temperatures.

38. (New) The system as recited in claim 19, further comprising:

a sensor to measure a total flow rate of the wellbore at a wellhead,

wherein the processor system is configured to allocate, using the model, the total flow rate among the plurality of wellbore zones based on the sensed temperature data to allocate the flow rates.